Listing of Claims

1   Claim 1 (Previously Presented): A method of processing a plurality of keep-alive

2   messages generated by a corresponding plurality of end systems, each of said plurality of

3   keep-alive messages being designed to request the status of a corresponding point to point

4   (PPP) session implemented on a communication network, said method comprising:

5   receiving in an aggregation device said plurality of keep-alive messages;

6   generating in said aggregation device an aggregated request packet which includes

7   data indicating that the status of said PPP sessions is requested; and

8   sending said aggregated request packet to a peer aggregation device.

1   Claim 2 (Original): The method of claim 1, further comprising:

2   receiving said aggregated request packet in said peer aggregation device;

3   indicating the status of said plurality of sessions in an aggregated reply packet; and

4   sending said aggregated reply packet to said aggregation device.

1   Claim 3 (Original): The method of claim 1, further comprising receiving in said

2   aggregation device an aggregated reply packet from said peer aggregation device, wherein

3   said aggregated reply packet indicates the status of at least some of said plurality of PPP

4   sessions.

1   Claim 4 (Previously Amended): The method of claim 3, further comprising sending

2   from said aggregation device a proxy keep-alive reply message to one of said plurality of end

3   systems originating a corresponding one of said keep alive-messages without waiting for said

4   aggregated reply packet.

1   Claim 5 (Original): The method of claim 4, further comprising:

2   maintaining a remote status table in said aggregation device, wherein said remote

3   status table indicates the status of sessions supported by said aggregation device;

4   updating said remote status table with the information in said aggregated reply packet;

5   and

6   generating said proxy keep-alive reply according to said remote status table.

1   Claim 6 (Original): The method of claim 5, wherein said proxy keep-alive message

2   indicates that the corresponding session is alive/OK when a first keep-alive message is

3   received for the corresponding session.

1   Claim 7 (Original): The method of claim 6, further comprising initializing the status

2   of each of said session to alive/OK such that said proxy keep-alive message in response to

3   said first keep-alive message indicates alive/OK status.

1   Claim 8 (Original): The method of claim 1, wherein said communication network is

2   implemented using one of frame relay, ATM and IP networks.

1   Claim 9 (Original): The method of claim 1, wherein said aggregation device is one

2   of a network access server and home gateway.

1   Claim 10 (Previously Presented): A method of processing an aggregated request

2   packet in an aggregation device, wherein said aggregated request packet is received from a

3   peer aggregation device and indicates that the status of a plurality of point-to-point sessions

4   is requested, said method comprising:

5   examining said aggregated request packet to determine that the status of said plurality

6   of point-to-point sessions is requested;

7   determining the status of each of said plurality of point-to-point sessions;

8   generating an aggregated reply packet indicating the status of said plurality of point-

9   to-point sessions; and

10   sending said aggregated reply packet to said peer aggregation device.

1   Claim 11 (Original): The method of claim 10, wherein said determining comprises

2   accessing a local status table which contains the status information of at least some of said

3   plurality of point-to-point sessions.

1   Claim 12 (Original): The method of claim 10, wherein said generating comprises

2   including a client magic number associated with each of said plurality of point-to-point

3   sessions.

1   Claim 13 (Original): The method of claim 10, wherein said generating comprises

2   setting a bit to one logical value to indicate that a corresponding one of said plurality of

3   sessions is OK/alive, and to another logical value to indicate that said corresponding one of

4   said plurality of session not OK/alive.

1   Claim 14 (Original): The method of claim 10, wherein said aggregation device

2   comprises one of a network access server (NAS) and a home gateway implemented in a

3   communication network.

1   Claim 15 (Previously Presented): An aggregation device for processing a plurality of

2   keep-alive messages generated by a corresponding plurality of end systems, each of said

3   plurality of keep-alive messages being designed to request the status of a corresponding point

4   to point (PPP) session implemented on a communication network, said aggregation device

5   comprising:

6   an input interface receiving said plurality of keep-alive messages;

7   a message aggregator coupled to said input interface, said message aggregator

8   examining said plurality of messages and generating data according to a format indicating

9   that the status of said PPP sessions is requested; and

10   an output interface sending an aggregated request packet on said communication

11   network to a peer aggregation device, said aggregated request packet containing said data

12   generated by said message aggregator.

1   Claim 16 (Original): The aggregation device of claim 15, further comprising an

2   encapsulator encapsulating said data in a packet suitable for transmission on said

3   communication network.

1   Claim 17 (Original): The aggregation device of claim 16, further comprising:

2   a remote status table indicating the status of sessions supported by said aggregation

3   device; and

4   a de-aggregator receiving an aggregated reply packet from said peer aggregation

5   device, wherein said aggregated reply packet indicates the status of at least some of said

6   plurality of PPP sessions, said de-aggregator updating said remote status table with the

7   information in said aggregated reply packet.

1   Claim 18 (Original): The aggregation device of claim 17, further comprising a proxy

2   reply unit sending a proxy keep-alive reply message to one of said plurality of end systems

3   originating a corresponding one of said keep alive-messages without waiting for said

4   aggregated reply packet.

1   Claim 19 (Original): The invention of claim 18, wherein said aggregation device

2   comprises a network access server.

1   Claim 20 (Original): The aggregation device of claim 18, wherein said aggregated

2   request packet contains a magic number related to each of the corresponding sessions.

1   Claim 21 (Previously Presented): An aggregation device for processing a plurality of

2   keep-alive messages generated by a corresponding plurality of end systems, each of said

3   plurality of keep-alive messages being designed to request the status of a corresponding point

4   to point (PPP) session implemented on a communication network, said aggregation device

5   comprising:

6   first means for receiving said plurality of keep-alive messages;

7   means for generating an aggregated request packet which includes data indicating that

8   the status of said PPP sessions is requested; and

9   means for sending said aggregated request packet to a peer aggregation device.

1   Claim 22 (Original): The aggregation device of claim 21, further comprising second

2   means for receiving an aggregated reply packet from said peer aggregation device, wherein

3   said aggregated reply packet indicates the status of at least some of said plurality of PPP

4   sessions.

1   Claim 23 (Original): The aggregation device of claim 22, further comprising means

2   for sending a proxy keep-alive reply message to one of said plurality of end systems

3   originating a corresponding one of said keep alive-messages without waiting for said

4   aggregated reply packet.

1   Claim 24 (Original): The aggregation device of claim 23, further comprising:

2   means for maintaining a remote status table in said aggregation device, wherein said

3   remote status table indicates the status of sessions supported by said aggregation device;

4   means for updating said remote status table with the information in said aggregated

5   reply packet; and

6   means for generating said proxy keep-alive reply according to said remote status table.

1   Claim 25 (Previously Presented): An aggregation device for processing an aggregated

2   request packet, wherein said aggregated request packet is received from a peer aggregation

3   device and indicates that the status of a plurality of point-to-point sessions are requested, said

4   aggregation device comprising:

5   means for examining said aggregated request packet to determine that the status of

6   said plurality of point-to-point sessions is requested;

7   means for determining the status of each of said plurality of point-to-point sessions;

8   means for generating an aggregated reply packet indicating the status of said plurality

9   of point-to-point sessions; and

10   means for sending said aggregated reply packet to said peer aggregation device.

1   Claim 26 (Original): The aggregation device of claim 25, wherein said means for

2   determining comprises means for accessing a local status table which contains the status

3   information of at least some of said plurality of point-to-point sessions.

1   Claim 27 (Original): The aggregation device of claim 25, wherein said means for

2   generating includes a client magic number associated with each of said plurality of point-to-

3   point sessions.

1   Claim 28 (Original): The aggregation device of claim 25, wherein said means for

2   generating sets a bit in said aggregated reply packet to one logical value to indicate that a

3   corresponding one of said plurality of sessions is OK/alive, and to another logical value to

4   indicate that said corresponding one of said plurality of session not OK/alive.

1   Claim 29 (Original): The aggregation device of claim 25, wherein said aggregation

2   device comprises one of a network access server (NAS) and a home gateway implemented

3   in a communication network.

1   Claim 30 (Previously Presented): An aggregation device for processing an aggregated

2   request packet, wherein said aggregated request packet is received from a peer aggregation

3   device and indicates that the status of a plurality of point-to-point sessions are requested, said

4   aggregation device comprising:

5   an input interface receiving said aggregated request packet;

6   a de-encapsulator examining said aggregated request packet to determine that the

7   status of said plurality of point-to-point sessions is requested;

8   a reply generator determining the status of each of said plurality of point-to-point

9   sessions, and generating an aggregated reply packet indicating the status of each of said

10   plurality of point-to-point sessions; and

11   an output interface sending said aggregated reply packet to said peer aggregation

12   device.

1   Claim 31 (Original): The aggregation device of claim 30, further comprising a local

2   status table storing the status information of at least some of said plurality of point-to-point

3   sessions, wherein said reply generator determines the status of said at least some of said

4   plurality of point-to-point sessions by accessing said local status table.

1   Claim 32 (Original): The aggregation device of claim 31, further comprising a session

2 manager updating the status of said plurality of point-to-point sessions in said local status

3 table.

1   Claim 33 (Original): The aggregation device of claim 30, wherein said reply generator

2 includes in said aggregated reply packet a client magic number associated with each of said

3 plurality of point-to-point sessions.

1   Claim 34 (Original): The aggregation device of claim 30, wherein said reply generator

2 sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding

3 one of said plurality of sessions is OK/alive, and to another logical value to indicate that said

4 corresponding one of said plurality of session not OK/alive.

1   Claim 35 (Original): The aggregation device of claim 30, further comprising a keep-

2 alive processor coupled to said de-encapsulator, wherein said keep-alive processor examines

3 said aggregated request packet to determine that status of point-to-point sessions is requested

4 and causes said reply generator to generate said aggregated reply packet.

1   Claim 36 (Original): The aggregation device of claim 30, wherein said aggregation

2 device comprises one of a network access server (NAS) and a home gateway implemented

3 in a communication network.

1   Claim 37 (Previously Presented): A computer-readable medium carrying one or more

2 sequences of instructions for causing a aggregation device to process a plurality of keep-alive

3 messages generated by a corresponding plurality of end systems, each of said plurality of

4 keep-alive messages being designed to request the status of a corresponding point to point

5 (PPP) session implemented on a communication network, wherein execution of said one or

6 more sequences of instructions by one or more processors contained in said aggregation

7 device causes said one or more processors to perform the actions of:

8   receiving in an aggregation device said plurality of keep-alive messages;

9   generating in said aggregation device an aggregated request packet which includes

10   data indicating that the status of said PPP sessions is requested; and

11   sending said aggregated request packet to a peer aggregation device.

1   Claim 38 (Original): The computer-readable medium of claim 37, further comprising:

2   receiving said aggregated request packet in said peer aggregation device;

3   indicating the status of said plurality of sessions in an aggregated reply packet; and

4   sending said aggregated reply packet to said aggregation device.

1   Claim 39 (Original): The computer-readable medium of claim 37, further comprising

2   receiving in said aggregation device an aggregated reply packet from said peer aggregation

3   device, wherein said aggregated reply packet indicates the status of at least some of said

4   plurality of PPP sessions.

1   Claim 40 (Original): The computer-readable medium of claim 39, further comprising

2   sending a proxy keep-alive reply message to one of said plurality of end systems originating

3   a corresponding one of said keep alive-messages without waiting for said aggregated reply

4   packet.

1   Claim 41 (Original): The computer-readable medium of claim 40, further comprising:

2   maintaining a remote status table in said aggregation device, wherein said remote

3   status table indicates the status of sessions supported by said aggregation device;

4   updating said remote status table with the information in said aggregated reply packet;

5   and generating said proxy keep-alive reply according to said remote status table.

1   Claim 42 (Previously Presented): A computer-readable medium carrying one or more

2   sequences of instructions for causing an aggregation device to process an aggregated request

3   packet, wherein said aggregated request packet is received from a peer aggregation device

4   and indicates that the status of a plurality of point-to-point sessions are requested, wherein

5   execution of said one or more sequences of instructions by one or more processors contained

6   in said aggregation device causes said one or more processors to perform the actions of:

7   examining said aggregated request packet to determine that the status of said plurality

8   of point-to-point sessions is requested;

9   determining the status of each of said plurality of point-to-point sessions;

10   generating an aggregated reply packet indicating the status of said plurality of point-

11   to-point sessions; and

12   sending said aggregated reply packet to said peer aggregation device.

1   Claim 43 (Original):The computer-readable medium of claim 42, wherein said

2   determining comprises accessing a local status table which contains the status information

3   of at least some of said plurality of point-to-point sessions.

1   Claim 44 (Original): The computer-readable medium of claim 42, wherein said

2   generating comprises including a client magic number associated with each of said plurality

3   of point-to-point sessions.

1   Claim 45 (Original): The computer-readable medium of claim 42, wherein said

2   generating comprises setting a bit to one logical value to indicate that a corresponding one

3   of said plurality of sessions is OK/alive, and to another logical value to indicate that said

4   corresponding one of said plurality of session not OK/alive.

1   Claim 46 (Original): The computer-readable medium of claim 42, wherein said

2   aggregation device comprises one of a network access server (NAS) and a home gateway

3   implemented in a communication network.

1   Claim 47 (Previously Presented): A communication network comprising:

2   a first aggregation device receiving a plurality of keep-alive messages generated by

3   a corresponding plurality of end systems, each of said plurality of keep-alive messages being

4   designed to request the status of a corresponding point to point (PPP) session implemented

5   on said communication network, said first aggregation device generating an aggregated

6   request packet which includes data indicating that the status of said PPP sessions is requested,

7   and sending said aggregated request packet; and

8   a peer aggregation device receiving said aggregated request packet and indicating the

9   status of said plurality of sessions in an aggregated reply packet, said peer aggregation packet

10   sending said aggregated reply packet to said first aggregation device,

11   wherein each of said first aggregation device and said peer aggregation device is

12   implemented as a single device.

1   Claim 48 (Previously Presented): The communication network of claim 47, wherein

2   said first aggregation device is located at an edge of said communication networks.

1   Claim 49 (Previously Presented): The communication network of claim 48, further

2   comprising an access network coupling said first aggregation device to said corresponding

3   plurality of end systems, wherein said plurality of keep-alive messages are received on said

4   access network.

1   Claim 50 (Previously Presented): The communication network of claim 49, wherein

2   said first aggregation device and said peer aggregation device respectively comprise a

3   network access server (NAS): and a home gateway.

1   Claims 51 - 58 (Canceled):

1   Claim 59 (Previously Presented): The method of claim 1, wherein said aggregation

2   device is physically separate from said plurality of end systems.

1   Claim 60 (Previously Presented): The method of claim 10, wherein said aggregation

2   device is physically separate from said plurality of end systems.

1   Claims 61 - 66 (Canceled)

1   Claim 67 (Previously Presented): The method of claim 1, wherein said generating

2   includes less data in said aggregated request packet than the data forming said plurality of

3   keep-alive messages together.

1   Claim 68 (Previously Presented): The method of claim 67, wherein each of said

2 plurality of keep-alive messages contains an identifier of a corresponding PPP session,

3 wherein said generating comprises:

4   selecting said identifier of each of said plurality of keep-alive messages; and

5   forming said aggregated request packet from said identifiers,

6   whereby said aggregated request packet contains less data than said plurality of keep-

7 alive messages together.

8   Claim 69 (Previously Presented): The method of claim 1, wherein each of said PPP

9 sessions terminates at a home gateway, and wherein said aggregation device comprises a

10 switching device and is in the path of each of said PPP sessions from a corresponding one of

11 said plurality of end systems to said home gateway.

1   Claim 70 (Previously Presented): The aggregation device of claim 30, wherein said

2 reply generator includes less data in said aggregated request packet than the data forming said

3 plurality of keep-alive messages together.

1   Claim 71 (Previously Presented): The aggregation device of claim 70, wherein each

2 of said plurality of keep-alive messages contains an identifier of a corresponding PPP session,

3 wherein said reply generator operates to:

4   select said identifier of each of said plurality of keep-alive messages; and

5   form said aggregated request packet from said identifiers,

6   whereby said aggregated request packet contains less data than said plurality of keep-

7 alive messages together.

8   Claim 72 (Previously Presented): The aggregation device of claim 30, wherein each

9 of said PPP sessions terminates at a home gateway, and wherein said aggregation device

10 comprises a switching device and is in the path of each of said PPP sessions from a

11 corresponding one of said plurality of end systems to said home gateway.

1   Claim 73 (Previously Presented): The computer readable medium of claim 37,

2   wherein said generating includes less data in said aggregated request packet than the data

3   forming said plurality of keep-alive messages together.

1   Claim 74 (Previously Presented): The computer readable medium of claim 73,

2   wherein each of said plurality of keep-alive messages contains an identifier of a

3   corresponding PPP session, wherein said generating comprises:

4   selecting said identifier of each of said plurality of keep-alive messages; and

5   forming said aggregated request packet from said identifiers,

6   whereby said aggregated request packet contains less data than said plurality of keep-

7   alive messages together.

8   Claim 75 (Previously Presented): The computer readable medium of claim 37,

9   wherein each of said PPP sessions terminates at a home gateway, and wherein said

10   aggregation device comprises a switching device and is in the path of each of said PPP

11   sessions from a corresponding one of said plurality of end systems to said home gateway.

1   Claim 76 (Previously Presented): The aggregation device of claim 21, wherein said

2   means for generating includes less data in said aggregated request packet than the data

3   forming said plurality of keep-alive messages together.

1   Claim 77 (Previously Presented): The aggregation device of claim 76 wherein each

2   of said plurality of keep-alive messages contains an identifier of a corresponding PPP session,

3   wherein said means for generating operates to:

4   select said identifier of each of said plurality of keep-alive messages; and

5   form said aggregated request packet from said identifiers,

6   whereby said aggregated request packet contains less data than said plurality of keep-

7   alive messages together.

1   Claim 78 (Previously Presented): The aggregation device of claim 21, wherein each

2   of said PPP sessions terminates at a home gateway, and wherein said aggregation device

3   comprises a switching device and is in the path of each of said PPP sessions from a

4   corresponding one of said plurality of end systems to said home gateway.

1   Claim 79 (Previously Presented): The method of claim 1, wherein said receiving, said

2   generating and said sending are performed in an aggregation device implemented as a single

3   device.

1   Claim 80 (Previously Presented): The method of claim 10, wherein said examining,

2   said determining, said generating and said sending are performed in said aggregation device

3   implemented as a single device.

1   Claim 81 (Previously Presented): The aggregation device of claim 21, wherein said

2   means for receiving, said means for generating and said means for sending are contained in

3   said aggregation device implemented as a single device.

1   Claim 82 (Currently Amended): The aggregation device of claim 25, wherein said

2   means for examining, said means for determining, said means for generating and said means

3   for sending are implemented in said aggregation device implemented as a single device.

1   Claim 83 (Previously Presented): The aggregation device of claim 30, wherein said

2   input interface, said de-encapsulator, said reply generator and said output interface are

3   contained in said aggregation device implemented as a single device.

1   Claim 84 (Previously Presented): The computer readable medium of claim 37,

2   wherein said receiving, said generating and said sending are performed by said aggregation

3   device implemented as a single device.

1   Claim 85 (Previously Presented): The computer readable medium of claim 42,

2   wherein said examining, said determining, said generating and said sending are performed

3   by said aggregation device implemented as a single device.